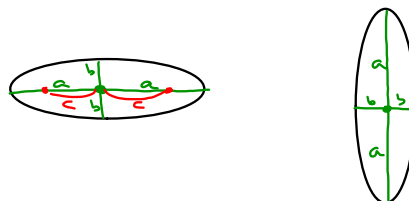
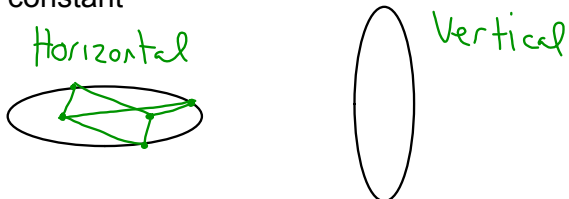


## 8.4 Ellipses

Ellipse--the set of all points such that the sum of the distances from a point to two fixed points (foci) is a constant

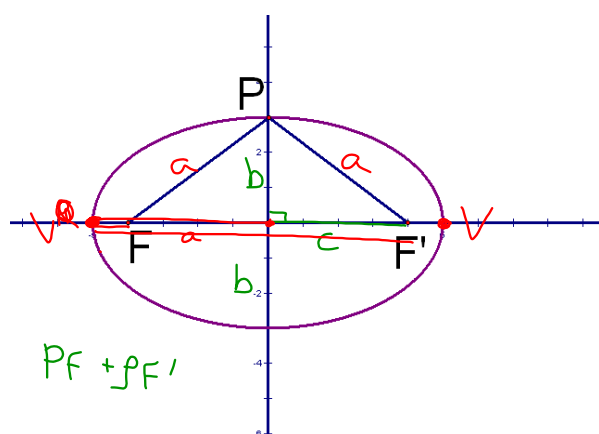


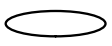
Axes are parallel to the coordinate axes


$2a$  = length of major axis

$2b$  = length of minor axis

$c$  = distance from center to foci



Horizontal Ellipse   $\frac{(x-h)^2}{a^2} + \frac{(y-k)^2}{b^2} = 1$

Vertical Ellipse   $\frac{(x-h)^2}{b^2} + \frac{(y-k)^2}{a^2} = 1$

$a > b > 0$

$C(h, k)$

$a^2 = b^2 + c^2$

$2a$  = sum of focal radii  
Vertices-endpoints of major axis

GSP

Reflective properties

[http://www.ies.co.jp/math/java/conics/focus\\_ellipse/focus\\_ellipse.html](http://www.ies.co.jp/math/java/conics/focus_ellipse/focus_ellipse.html)

$$\frac{(x)^2}{9} + \frac{(y)^2}{16} = 1$$

$$C(0,0)$$

$$a=4$$

$$b=3$$

$$c=\sqrt{7}$$

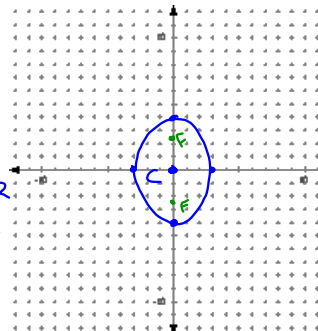
$$F_1(0,\sqrt{7})$$

$$F_2(0,-\sqrt{7})$$

$$a^2 = b^2 + c^2$$

$$16 = 9 + c^2$$

$$\sqrt{7} = c$$



$$\frac{(x-4)^2}{25} + \frac{(y+5)^2}{16} = 1$$

$$C(4,-5)$$

$$a=5$$

$$b=4$$

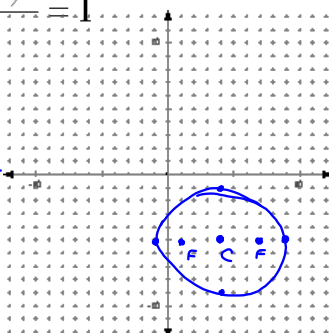
$$c=3$$

$$F(7,-5)$$

$$F_2(1,-5)$$

$$25 = 16 + c^2$$

$$9 = c^2$$



$$9x^2 + 4y^2 - 18x + 16y - 11 = 0$$

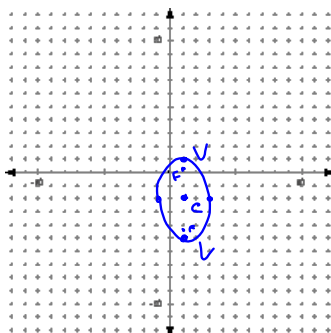
$$9x^2 - 18x + 4y^2 + 16y = 11$$

$$9(x^2 - 2x + 1) + 4(y^2 + 4y + 4) = 11$$

$$9(x-1)^2 + 4(y+2)^2 = 36$$

$$\frac{(x-1)^2}{4} + \frac{(y+2)^2}{9} = 1$$

$C(1, -2)$   
 $a = 3$   
 $b = 2$   
 $c = \sqrt{5}$   
 $q = 4 + c^2$   
 $\sqrt{5} = c$   
 $F_1(1, -2 + \sqrt{5})$   
 $F_2(1, -2 - \sqrt{5})$



Write the equation of an ellipse with a  $C(0,0)$  and a horizontal major axis.

$a = 6$   
 $b = 4$

$$\frac{x^2}{36} + \frac{y^2}{16} = 1$$

Write the equation of an ellipse with x-intercepts of  $\pm\sqrt{2}$  and y-intercepts of  $\pm 3$

$C(0,0)$   
 $a = 3$   
 $b = \sqrt{2}$

$$\frac{x^2}{2} + \frac{y^2}{9} = 1$$

Write the equation of an ellipse with Foci,  $F(-2, 0)$  and  $F(2, 0)$  and  $a = 7$

$C(0,0)$   
 $a = 7$   
 $c = 2$   
 $a^2 = b^2 + c^2$   
 $49 = b^2 + 4$   
 $45 = b^2$

$$\frac{x^2}{49} + \frac{y^2}{45} = 1$$

HW  
p438  
13-21 odd, 29, 35

Attachments

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ellipse.gsp

ellipse(1).gsp